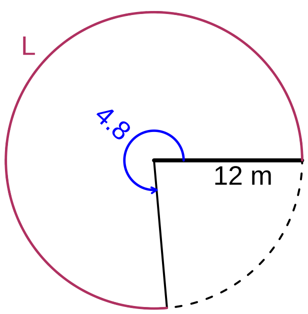
Name: Date:

## Trig Final (Solution v50)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 12 meters. The angle measure is 4.8 radians. How long is the arc in meters?

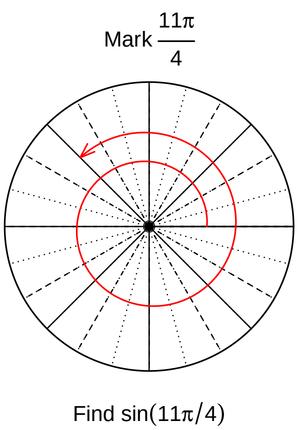


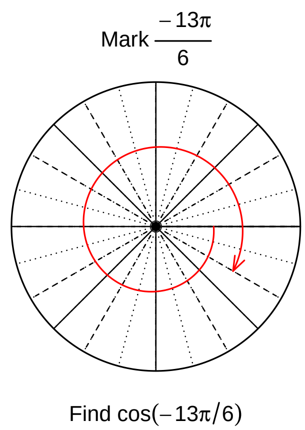

$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 57.6$ meters.

### Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{4}\right)$ and $\cos\left(\frac{-13\pi}{6}\right)$ by using a unit circle (provided separately).



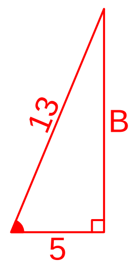

$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(-13\pi/6) = \frac{\sqrt{3}}{2}$

**Question 3**

If $\cos(\theta) = \frac{-5}{13}$, and $\theta$ is in quadrant III, determine an exact value for $\tan(\theta)$.

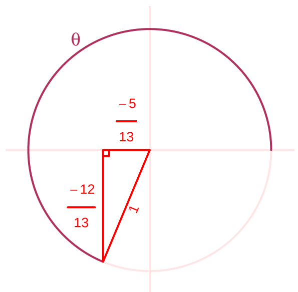
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.




Solve the Pythagorean Equation

$$5^2 + B^2 = 13^2$$
$$B = \sqrt{13^2 - 5^2}$$
$$B = 12$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.




$$\tan(\theta) = \frac{\frac{-12}{13}}{\frac{-5}{13}} = \frac{12}{5}$$

**Question 4**

A mass-spring system oscillates vertically with a midline at $y = -8.66$ meters, a frequency of 5.51 Hz, and an amplitude of 7.09 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height ($y$ in meters) as a function of time ($t$ in seconds).

Any of these equations would get full credit.

$$y = -7.09\cos(2\pi 5.51t) - 8.66$$

or

$$y = -7.09\cos(11.02\pi t) - 8.66$$

or

$$y = -7.09\cos(34.62t) - 8.66$$